

AN EPIDEMIOLOGICAL STUDY OF MENTAL RETARDATION WITHOUT A COMMON GENETIC CAUSE, IN THE POPULATION OF HIMACHAL PRADESH, INDIA

THAKUR NEELAM & VERMA SAVITRI

Department of Biosciences, Himachal Pradesh University, City-Shimla, Country-India

ABSTRACT

This study evaluated the contribution of potential risk factors of mental retardation without a common genetic cause of aware the population and delineate intercession methods. The present study included 150 MR of unrevealed causes and 150 normal children as a control for taking account of attribution of dysmorphic features, deformities, development deceleration, pedigrees of MR, delayed development, etc. For ascertaining the degree of mental retardation, Stanford-Binet Intelligence test was conducted for every patient and alienated into two categories i.e. Mild (IQ 70 to 50-55) and serious category (IQ< 50-55). We abstracted information on demographic, prenatal, perinatal and neonatal risk factors of MR which was selected stringently based on recent literature. The parental age effect was not observed in mild MR but in severe mental retardation, risk augmented steadily and autonomously with increasing maternal age. Lack of maternal education, history of pregnancy loss, no consanguinity, birth at home, neonatal infections, lack of breast feeding, diarrhea were independently associated with mild congenital abnormality. Whereas, the prevalence of serious congenital abnormality was found to be concomitant with maternal illiteracy, consanguinity, multiple births, neonatal jaundice and lack of breast feeding. This work is uncovering the present situation and ascertains the utmost tenacious interventions to decrease the occurrence of childhood MR in Himachal Pradesh.

KEYWORDS: Paternal Age Effect, Maternal Age Effect, Economic Status, Late Birth Cry & Neonatal Jaundice

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INTRODUCTION

Impact of MR on families and society is considerable due to its effect on quality of life and efficiency as a whole. IQ is not the solely means of measuring MR but adaptive behavior and systems of supports also need to be measured (AAMR, 1992). Standardized measures of intelligence become effective only when a child is older than 5 years because cases with mild mental retardation can only be ascertained when elementary education get started. According to an estimate, 3% of children globally marked some degree of MR (McLaren and Bryson, 1987; Stevenson et al., 1996; Zeldin and Kao, 2012), even though estimates fluctuate with the demographic and socio-economic composition of population's cohorts (Charara et al. 2017; Lakhan et al., 2015; Maulik et al. 2011), with definitions and investigation, design (McKenzie et al., 2016). As far as our knowledge, information regarding causes of non-genetic MR is scarce, so present study documented demographic, prenatal, perinatal and neonatal risk factors that might be direct causative elements or lie somewhere in the causal pathway. Our health system can be protected from this lifelong disability when these risk factors can be monitored stringently and burden of the society could be reduced.

METHODOLOGY

Subjects

Participants of the present study were by design, 150 MR patients with non- genetic cause and 150 individuals as a control group with normal cognition. Every patient was individually attended by researcher and assessed for getting information by filling a proforma, which incorporated variables that selected a priori as potential risk factors, for mental retardation. Severity was classified according to Stanford-Binet test: 50-55 to 70 for mild, 35-40 to 50-55 for moderate, 20-25 to 35-40 for severe and <20-25 for profound. In the present study moderate, severe and profound degrees were combined into a single category known as serious. All MR, mild and serious patients were further categorized into isolated and cases with other neurological abnormalities like epilepsy, microcephaly, visual impairments, hearing impairments for ascertaining the authentic association of risk factors with MR. All control subjects did not have any of neurological abnormalities incorporated in our delineation.

Statistical Treatment

To compute the weighted estimates of the prevalence of risk factors in MR, statistical techniques like frequency, percentage, mean were used. The chi - square test was performed to evaluate the association between MR and potential risk factors, P values below 0.05 were considered statistically significant.

RESULTS

This study cohort included 150 children attributed to MR of unknown etiology from various places of Himachal Pradesh with a mean age of 14.5 years (range: 10–17 years). Among all children with a diagnosis of MR of unknown cause, males outnumbered females by a ratio of 2.6:1.

Isolated MR Cases

Children with isolated MR was found to be associated with parental age (paternal age, maternal age), economic status, cohabitation with the male partner who drinks heavily, late birth cry and multiple births. Most of them had birth at home, suffered from jaundice in the infant stage and were not breast fed (Table 1).

MR Cases with other Neurological Disorders

This condition also showed the same association; like isolation, but certain differences were found, i.e no maternal age effect was noticed, most of them had delivery in hospital, had the history of high body temperature during pregnancy etc. (Table 1).

Isolated Mild MR Cases

It had same associations as are found in isolated MR cases except two factors, i.e. advanced maternal age and neonatal jaundice, which showed no significant relations (Table 2).

Mild MR Cases with Other Neurological Disorders

Similar associations were noticed as in mild isolated MR except some features like advanced maternal age effect was seen and had a history of high body temperature of the mother during gestation period. When compared with MR cases having other neurological disorders, no maternal age effect was found and history of first trimester bleeding was seen in the mother during the gestation period (Table 2).

Serious isolated MR cases

In serious isolated MR, predictors of MR were advanced maternal age, low economic status, late birth cry, multiple births, neonatal jaundice and lack of breastfeeding. Risk factor, cohabitation with the male partner who drinks heavily was more likely associated with serious MR (Table 3).

Serious MR cases with other neurological disorders

These cases also showed similar associations as are seen in serious isolated cases except consanguinity which was found to be significantly associated and cohabitation with the male partner who drinks heavily was not proved to be a potent risk factor. Most of the cases were born at home. But in MR cases having other neurological disorders factors like paternal age, history of first trimester bleeding, consanguinity and high body temperature during pregnancy showed associations. Consanguinity was not observed in parents of MR cases with other neurological disorders (Table 3).

DISCUSSIONS

Mental retardation is one of the most difficult categories to document epidemiologically because causative reasons are obscure (Richmond et al., 1983). The present study examined the association of various risk factors with various subgroups of mental retardation in a sample of 150 patients. This study was focused on demographic, prenatal, prenatal and neonatal risk factors, which might be associated with less cognitive development.

A wide variety of mental health conditions like Down's syndrome, schizophrenia, autism spectrum disorders has been linked with biological parental age at conception (Bilder et al., 2009; Erik et al., 2012; Miller et al., 2011; Sandin et al., 2012; Sherman et al., 2007). Previously, it was believed that possibility of mental retardation is greater in the older mother as compared to the older father (Cohen, 2014; Croen et al., 2001; Hassold, and Hunt, 2009; Hidayat, 2017; Huang et al., 2016). But, present study is in sharp contrast to previous ones; both maternal and paternal age effect was found in mentally retarded individuals. Mild mental retardation was found to be associated with the father's age in isolated cases, but not in serious cases, but serious cases were found to be associated in an independent manner with maternal age. Our results are in line with many studies done so far (Drews et al., 1995; Lisa et al., 2001). It is well-known fact that heightened risks of mental retardation with advanced maternal age is due to errors which occur during chromosomal segregation (Hassold and Hunt, 2009). Conversely, emergent awareness also gives an indication about that advanced paternal age at childbearing is associated with offspring morbidity, including psychiatric disorders. A recent work suggested that increased de novo mutations in men's sperms as aging occurs may play important role in increasing rates of cognitive disability (Kong et al., 2012).

Previous studies suggested the difference in the effect of socio-economic status on an occurrence of mild and severe mental retardation (Emerson et al., 2006; Olson and Hwang, 2008; Muntaner et al., 2004), but the present study showed the dependence of this factor, over all subgroups of MR. The difference persisted in the occurrence of consanguinity in various subgroups of mental retardation, only serious MR cases were significantly associated and this information showed co linearity with many previous studies (Durkin et al., 1998). Cohabitation with the male partner who drinks heavily also found to be associated with various degrees of MR which is in contrast to information given by a study done by Durkin et al. in 2000. This is a well-known fact that immediate birth cry is needed for preventing brain damage due to asphyxia which can be the cause of many mental disorders in infants (Golubnitschaja et al., 2011). This risk factor was also found to be associated with various levels of MR. Like other investigators ((Boyle et al., 1997; Camp et al., 1998),

we also found a significant association between multiple births and all subgroups of MR. Neonatal Jaundice proved to be a potent neonatal factor in mild and MR cases but no significant association was observed in serious cases. Neonatal jaundice was suggested to be a risk factor for brain damage in a study, done by Ullah et al. 2016. Most of the cases were born at home, which depicts that lack of medical facilities could also be the reason which might be associated with other factors like neonatal jaundice, neonatal breathing difficulties etc. Studies related to finding association between breast feeding and incidences of mental disorders are obscure, keeping this in mind we had also considered this factor to find the association and we observed that all degrees of MR were significantly associated with this factor. This information is in line with many previous studies (Anselmi et al., 2008; De Mola et al., 2016; Kramer et al., 2011; Kwok et al., 2013; Lind et al., 2014). Mental retardation (MR) has distressing effects on people and the health system so the salutogenic perspective of parents having mentally retarded children also needs to be compared with control group.

CONCLUSIONS

It is noteworthy that many risk factors showed associations only in isolated cases, which was the purpose of classifying samples in subgroups for controlling the effects of other neurological factors on MR. In this regard our study is unique moreover consistency with other reports also overweighs its dependability to its association with major risk factors and this information can help people in providing confirmation about pathogenesis, diagnosis, reappearance risk and appropriate medical intervention.

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APPENDICES

Table 1: Percentage Distribution of Various Variables in Population Cohorts of Mentally Retarded and Normal Individuals

Variables	Isolated MR (N=63)				MR with Other Neurological Conditions (N=87)				Control (N=150)	
Demographic Factors	N	%	X ² Value	Sig.	N	%	X ² Value	Sig.	N	%
1. Paternal age i. <30 ii. ≥30	45 18	71.43 28.57	5.00	0.025	61 26	70.11 29.89	7.11	0.008	127 23	84.67 15.33
2. Maternal age i. <30 ii. ≥30	48 15	76.19 23.81	5.41	0.02	71 16	81.60 18.40	2.29	0.13	133 17	88.67 11.33
3. Economic status i. Low ii. Middle iii. High	36 13 14	57.15 20.63 22.22	37.12	<0.001	49 21 17	56.32 24.14 19.54	42.00	<0.001	24 118 8	16.00 78.67 5.33

Table 1: contd.,										
Prenatal Factors										
1.Consanguinity	1	1.58	2.39	0.30*	2	2.29	3.48	0.13*	0	0.00
2. History of first trimester Bleeding	10	15.87	1.12	0.30	18	20.69	4.50	0.03	16	10.67
3. High body temperature during pregnancy	9	14.28	1.97	0.16	16	18.39	6.06	0.01	12	8.00
4. Maternal anemia	6	9.52	0.84	0.36	7	8.04	0.37	0.54	9	6.00
5. Maternal diabetes	2	3.17	2.01	0.21*	4	4.60	4.12	0.06*	1	0.67
6. Cohabitation with male partner who drinks heavily	17	26.98	6.20	0.01	24	27.59	11.24	0.001	16	10.67
Perinatal factors										
1. Late Birth cry <5 minutes	9	14.28	15.20	<0.001	18	20.69	26.7	<0.001	2	1.33
≥5minutes	5	7.94			6	6.90			0	0.00
2. Multiple birth	14	22.22	31.49	<0.001	19	21.84	31.94	<0.001	1	0.67
3. Born at home	41	65.08	4.82	0.03	59	67.82	3.91	0.05	119	79.33
Neonatal factors										
1.Neonatal jaundice	9	14.28	18.39	<0.001	20	22.99	33.97	<0.001	1	0.67
2.Neonatal breathing difficulty	4	6.35	1.66	0.24*	6	6.90	2.44	0.18*	4	2.67
3. Lack of breast feeding	27	42.86	54.29	<0.001	38	43.68	60.35	<0.001	5	3.33

Table 2: Association of Mild MR with Various Risk Factors in Isolated and Cases With Other Neurological Disorders

Variables	Isolated Mild MR (N=53)				Mild MR with Other Neurological Conditions (N=62)				Control (N=150)	
Demographic Factors	N	%	X ² Value	Sig.	N	%	X ² Value	Sig.	N	%
1.Paternal age										
i. <30	37	69.8	5.57	0.02	42	67.74	7.77	0.005	127	84.67
ii. ≥30	16	30.19			20	32.26			23	15.33
2.Maternal age										
i. <30	45	84.9	0.51	0.47	61	98.39	5.33	0.03*	133	88.67
ii. ≥30	8	15.09			1	1.61			17	11.33

Table 2: contd.,										
3.Economic status										
i. Low	31	58.4	39.31	<0.00	33	53.22	34.21	<0.001	24	16.00
ii. Middle	10	9		1	15	24.19			118	78.67
iii. High	14	18.8			14	22.59			8	5.33
		7								
		26.4								
		1								
Prenatal Factors										
1.Consanguinity	0	0.00	NA	NA	0	0.00	NA	NA	0	0.00
2. History of first trimester Bleeding	8	15.0	0.74	0.39	15	24.19	6.43	0.01	16	10.67
		9								
3. High body temperature during pregnancy	7	13.2	1.25	0.26	13	20.97	7.09	0.008	12	8.00
		1								
4. Maternal anemia	5	9.43	0.72	0.40	4	6.45	0.02	0.90*	9	6.00
5. Maternal diabetes	2	3.77	2.60	0.17*	3	4.83	4.12	0.08*	1	0.67
6. Cohabitation with male partner who drinks heavily	13	24.5	6.14	0.01	21	33.87	16.40	<0.001	16	10.67
		3								
Perinatal factors										
1. Late Birth cry	7	13.2	13.03	0.001	12	19.35	23.10	<0.001	2	1.33
<5 minutes	4	0		*	4	6.45			0	0.00
≥5minutes		7.54								
2. Multiple birth	9	16.9	22.56	<0.00	13	20.97	29.31	<0.001	1	0.67
		8		1						
3. Born at home	31	58.4	8.82	0.003	39	62.90	6.24	0.01	119	79.33
		9								
Neonatal factors										
1.Neonatal jaundice	1	1.89	0.60	0.46*	3	4.84	4.12	0.08*	1	6.67
2.Neonatal breathing difficulty	2	3.77	0.17	0.65*	4	6.45	1.73	0.24*	4	2.67
3. Lack of breast feeding	18	33.9	36.57	<0.00	27	43.54	55.36	<0.001	5	3.33
		6		1						

Table 3: Percent Distribution of Various Risk Factors and Their Association with Serious Mental Retardation

Variables	Isolated Serious MR (N=10)				Serious MR with Other Neurological Conditions (N=25)				Control (N=150)	
Demographic Factors	N	%	X ² Value	Sig.	N	%	X ² Value	Sig.	N	%
1. Paternal age										
i. <30	8	80.00	0.15	0.69	19	76.00	1.16	0.28	127	84.67
ii. ≥30	2	20.00			6	24.00			23	15.33
2. Maternal age										
i. <30	3	30.00	25.31	<0.001	10	40.00	33.97	<0.001	133	88.67
ii. ≥30	7	70.00			15	60.00			17	11.33
3. Economic status										
i. Low	5	50.00	7.30	0.007	16	64.00	28.00	<0.001	24	16.00
ii. Middle	3	30.00			6	24.00			118	78.67
iii. High	2	20.00			3	12.00			8	5.33
Prenatal Factors										
1. Consanguinity	1	10.00	15.09	0.06*	2	8.00	12.14	0.02*	0	0.00
2. History of first trimester Bleeding	2	20.00	0.82	0.37*	3	12.00	0.04	0.74*	16	10.67
3. High body temperature during pregnancy	2	20.00	1.69	0.21*	3	12.00	0.44	0.45*	12	8.00
4. Maternal anaemia	1	10.00	0.26	0.49*	3	12.00	1.21	0.38*	9	6.00
5. Maternal diabetes	0	0.00	0.07	0.80*	1	4.00	2.11	0.27*	1	0.67
6. Cohabitation with male partner who drinks heavily	4	40.00	7.38	0.02*	3	12.00	0.04	0.74*	16	10.67
Perinatal factors										
1. Late Birth cry <5 minutes	2	20.00	13.40	0.02*	6	24.00	25.24	<0.001	2	1.33
≥5 minutes	1	10.00	15.09		2	8.00	12.14		0	0.00
2. Multiple birth	5	50.00	63.22	<0.001	6	24.00	30.38	<0.001	1	0.67
3. Born at home	10	10.00	2.56	0.11	20	80.00	0.006	0.94	119	79.33
Neonatal factors										
1. Neonatal jaundice	8	80.00	111.1	<0.001	17	68.00	105.3	<0.001	1	0.67
2. Neonatal breathing difficulty	2	20.00	7.80	0.05*	2	8.00	1.84	0.20	4	2.67
3. Lack of breast feeding	9	90.00	88.19	<0.001	11	44.00	42.66	<0.001	5	3.33

- Use of superscript* in some χ^2 -values indicates that these χ^2 -values are computed using Fischer's exact test modification of χ^2 test due to small sample sizes.

